The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. L
No. 1296

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The Chemical Age

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The Government and Research

THE issue of the White Paper *Scientific Research and Development*, which contains a survey of existing official machinery for the promotion of scientific research and development, has been followed by a debate held in Parliament on April 19. The resolution giving rise to the debate laid stress on the vital part which research and science can play in reconstruction and called on the Government to declare their intention of giving generous financial assistance to scientific research as a means of promoting British prosperity after the war. It is now common knowledge that this debate resulted in a declaration by Mr. Attlee of the Government's sympathy, and with the promise of a bold policy of State assistance. Mr. Attlee, however, made the point, which we have repeatedly made in these columns, that research alone is of only minor industrial value; the crux of the matter is the use that industry makes of the results of research. Mr. Attlee rightly insisted that if the Government is to support research, an equal responsibility to apply that research devolves upon industry.

How the Government intends to implement the promises made on their behalf by Mr. Attlee has not been disclosed. It appears that the provision of adequate research depends on organisation and on finance. There must be organisation to keep up a sufficient flow of potential research men to the schools and universities and to provide for the training of these men; there must be some means of organising fundamental research, not in the sense of dictating of what that research shall consist, but of seeing that the opportunity for research is provided; there must be organisation such as is now afforded by the D.S.I.R. for providing for co-operative industrial research in every industry; and, of course, there must also be some means of correlating this research with the efforts of individual concerns. It is likely that machinery supplied by Government, but operated by the universities and industry, would provide the necessary method. Something of that sort will no doubt have to be set up.

The Government's principal immediate concern must presumably be that of finance. Some M.P.'s seemed to be satisfied with the "immense" resources of the universities in apparatus, equipment, and teaching facilities, but the truth is that the equipment of our universities in general leaves much to be desired, and many of them are fighting a brave battle with insufficient funds. There

On Other Pages

must therefore be finance for the provision of adequate buildings and equipment, both for fundamental research and for teaching. There must also be a good deal of direct Government expenditure on work such as is already provided for by the permanent Government research establishments as well as by other bodies which are operated by the Government directly or indirectly for the Services, for medical research, and for agricultural research.

There must also be some form of Government assistance for industry. Experience has shown that grants by the D.S.I.R. have helped industry to set up research associations by the encouragement of additional funds that make a comparatively moderate contribution on the part of industry into a really worthwhile total annual income. There is some doubt as to whether this principle should be continued after the war. While the country as a whole will benefit from improved trade, it would be very much better if industry could provide its own money for the maintenance of its research stations. If industrial firms provided a really substantial sum each year for this purpose they would have more interest in the results of researches carried out on their behalf than many of them now appear to show.

The part to be played by Government is to see that in order to finance problematical schemes of social amenities, industry is not denuded of the funds which should be applied to the development of trade. It was a Labour Member, Mr. Benson, who said that "if our industry is to expand after the war in competition with Germany and the United States, where vast sums are spent on research, we shall have to see that our high taxation does not form a barrier to research and be an unduly heavy burden on the widest experiments in industry." The Chancellor of the Exchequer should bear this in mind when considering the imposition of the Excess Profits Tax and of the income tax. There would be sound reason for regarding money spent genuinely on research and development work as tax-exempt. In considering research programmes in relation to post-war planning, it is well to distinguish between expenditure which is remunerative and that which is not. Many of the schemes of certain of our more ambitious planners will lead to expenditure far greater than is entailed by the whole national research programme, on subjects which, to say the least, are unnecessary. It is very nice to be able to afford additional luxuries, but we should not attempt to buy them until we have the money in the bank to pay for them. On the other hand, research expenditure properly applied is remunerative. It is not too much to say, for example, that research into the weapons of war has saved this country from becoming a vassal state of Germany. That is remunerative research which cannot be expressed in terms of money.

Sir G. Gibson, in proposing the motion in the House, declared that to win export trade after the war, it will be necessary to marshal all our resources, and he pointed out that, against the £5½ million spent by industry in this country on research, the United States spends ten times that amount and has 70,000 expert chemists as compared with our 7000. Mr. Salt declared that the number of scientific workers should be doubled and this would mean enlarging the universities and technical schools. He said that some £12,000,000 a year would be needed in the next five years for capital expenditure and asked that the Government should make a token payment immediately of £1,000,000 so that those in charge of the universities could make the necessary plans for extending their research. He pointed out that in exchange for this expenditure, the Parliamentary and Scientific Committee, reporting on coal research, said that in 1913 only 15 per cent. of the potential energy of coal was being utilised. This had risen to 30 per cent. in 1938 and the report considered that during the next 15 years it could be raised to 45 per cent. This would add no less than £200,000,000 per annum to the resources of the State, which would certainly more than pay for the cost of the several thousands of extra research workers who would have to be employed.

One of the best ways to encourage industrial research and invention is to encourage fundamental research, and it is equally important that trained research men shall be available in much greater numbers. Are we satisfied that the organisation of fundamental research and of teaching is sufficiently good? It appears to us that at present, fundamental research is undertaken at univer-

sities only because those who are engaged in teaching are sufficiently interested to devote their spare time to this work, and because they happen to be able to use it as a method of post-graduate training of their students. Should not universities be divided into research and teaching divisions? There are many excellent teachers who have no special research ability and there are many excellent research men who have no teaching ability. We do not suggest that the two sides should be completely divorced, but we should suggest that two separate departments, with staffs only partially interchangeable, should be set up. One would be staffed mainly by research professors who are not expected to undertake routine teaching, and who are therefore free to devote at least 80 per cent. of their time to research and the training of post-graduate students. The second department would be primarily a teaching department whose staffs would spend at least 80 per cent. of their time in teaching up to graduate standard. There should be a career for a man who is interested primarily in pure research and who is able to make his mark in a field entirely distinct from the purely teaching side of his profession.

One further matter which arose out of the debate is the suggestion that there should be a central organisation to make proper use of all our resources. This proposal requires further elaboration and it is mentioned here only as a subject to which thought should be devoted. It will not have escaped our readers that the Minister of Fuel and Power has recently announced his decision to set up a National Fuel Advisory Council to advise him on important aspects of the utilisation of our coal and fuel resources. Coal, however, is not the only raw material which we have. The proposal might go a little farther still in that a council of this sort could decide what industries should be set up in this country, and take steps to promote the setting up of these industries. Industrial firms are now making preparation for post-war industrial development. According to our information these plans are rather jealously guarded and no one is allowed to know what his next-door neighbour's plans are. This is no doubt sound policy from the point of view of the individual business under present conditions, but would it not be very much better if all such proposals could be put in confidence to a Central Advisory Council which would approve of them where they were sound, would indicate where costly overlapping seemed likely to occur, and would be able to suggest to firms certain lines of development in the manufacture of products not now made in this country. The home refining of petroleum and the setting up of a chemical industry based on the refineries, to which considerable reference has been made in these columns, would be the sort of thing to which such an advisory council might very well devote its attention.

NOTES AND COMMENTS

Turkish Chrome

AFTER prolonged negotiation, it was announced by the Turkish Foreign Minister last week that the export of all chrome to Germany would cease on April 21. This decision was taken following British and American representation on the subject. This stoppage of the export of chrome from Turkey is a serious blow to the war economy of the Axis; it will deprive Germany of at least half of her supplies of an essential alloying element. Some chrome is theoretically available in certain mines in Yugoslavia and Greece, but deliveries from these are problematical to-day, to say the least of it. It is pointed out that the weight of this blow will be all the heavier now that the manganese deposits of Nikopol are no longer accessible to the Germans, and that the tungsten supplies from Spain are reduced to a minimum. It was recently stated by Mr. Foot, Parliamentary Secretary to the Ministry of Economic Warfare, that Turkey's exports of chrome in 1943 amounted to 47,000 tons to Germany and 56,000 tons to the United Nations; in January and February, 1944, however, 14,800 tons went to Germany and only 1,870 tons to the Allies, the falling off in the latter supply being ascribed to transport difficulties. Reports from Ankara have stated that exports to Germany had also been greatly reduced during recent weeks for similar reasons.

News of the complete official stoppage, however, is extremely encouraging, and may be regarded as a tribute to the success of Allied diplomacy.

Chemical Plant Secrecy

TWO matters of specific interest to readers of THE CHEMICAL AGE were mentioned during last week's debate on scientific research. The first concerns chemical plant, the other scientific instruments. Mr. Wootton-Davies quoted a case in support of his contention that British industry must be more open-minded. India is about to buy a plant for making artificial silk by the acetate process which would cost £1,000,000; naturally, she wished to see what she would get. But no British manufacturer, claimed Mr. Wootton-Davies, was prepared to show the plant for making acetic acid, nor to show the machinery for making artificial silk. That order would go to America. The implication of this speaker's remarks was that a lot more orders would go to America unless a new race of purchasers sprang up who were prepared to buy a pig-in-a-poke. Pigs will fly before that happens, and we agree with Mr. Wootton-Davies that British manufacturers must be prepared to demonstrate their goods and explain how their machinery works and what it will do. Unless they do so the idea will gain ground that the present patent laws, which seem to find many constant and consistent defenders among industrialists, are not so protective and effective as their defenders claim.

Scientific Instruments

THE importance of scientific-instrument manufacture was brought forward by Captain Plugge. After the last war the occupied countries who had lost the whole of their laboratories and scientific apparatus turned to Britain for replacements, but we were unable to supply them. As a result of our failure in this sphere at that time we were thrusting into students' hands instruments made in Germany, with the effect that the idea became rooted in the students' minds that only the Germans could create those instruments. The occupied countries should not have to rely upon German equipment this time. We must be ready to supply the laboratories of Norway, Holland, France, and Belgium with all the scientific instruments they may require. As Captain Plugge said: We can produce instruments here as good as any that Germany can produce, but there must be some Government assistance to ensure that the instrument makers have plants large enough to produce high-quality instruments in quantity to meet the demands of Europe.

The Unity of Science

THE theme of the singleness of science was chosen by Sir Edward Appleton, F.R.S., for a lecture delivered to the Manchester Chamber of Commerce on Thursday last week. He made yet another appeal for the breaking-down of the division between what are called "pure" research and "applied" research. We put on record with equal readiness his disapproval of those purists who segard any scientific inquiry, leading to immediately useful results, as of only secondary importance, and his impatience with those self-styled realists who insist that science is exclusively the servant of society and must be pursued for practical ends alone. There are those who pursue discovery for its own sake, and those who create new knowledge, or utilise existing knowledge, for practical purposes; both are workers of equal status in the scientific field. Who shall decide, for example, whether Einstein's formulation of the theory of relativity or the discovery of penicillin is ultimately of the greater importance? One established a rung in the ladder of progress from which new discoveries could be attained, the other has saved and will save countless valuable lives, including, perhaps, some of those very scientists whose work would be based on Einstein's. An interesting point to which the lecturer called attention was that the general public had to-day become so accustomed to enjoying the fruits of research that they were in danger of regarding the scientific worker as their servant with the sole task of producing a succession of inventions of immediate use to themselves and to industry. We must not let them forget that these very inventions owed their existence to the "fundamental" research conducted with no thought of utility. Most of this work, moreover, Sir Edward Appleton said, was of British origin—a fact that we are happy to record, as it is too often forgotten.

Science and National Prosperity

Whole-Day Debate in the Commons

THE debate on research which the House of Commons staged on April 19 is worthy of close attention by all those engaged in the chemical industry and other industries in which progress depends upon the application of scientific knowledge. The occasion was unique, for it was the first time in the long history of the House that a full day had been allotted to discussion of research and scientific knowledge. The reading of the full report in *Hansard*—the particular issue was out-of-print within 24 hours of publication but is now being reprinted—is to be recommended, as is also the excellent summary in *The Times*.

We intend to restrict our report to the main points that emerged from the debate, though this may do but scant justice to the breadth of outlook that M.P.'s exhibited in the course of their many and varied speeches. It is worth recording that some twenty M.P.s contributed to the debate, a fact that is encouraging in itself since it is an indication that the House is more interested in science and technology than has generally been supposed. Doubtless, the activities of the Parliamentary and Scientific Committee have been largely responsible for what is, undoubtedly, a change in the parliamentary attitude towards science.

A Bold Research Policy

Members took a largely utilitarian view of the value of science, though the importance of fundamental research was stressed by more than one speaker. One felt that the House adopted the view of Mr. Price when he said he thought it was generally agreed that if Britain is to maintain its standard of living we must keep up a very high standard of technical efficiency in our industry. The thesis that research pays big dividends was taken as axiomatic, and therefore only a few instances showing its importance to industry and to the community were forthcoming. The mover of the motion—that there should be a bold and generous Government policy directed to the expansion of pure and applied research—instanced the saving of £10,000,000 through the invention of the process for rendering wool unshrinkable. Sir Granville Gibson drew attention to a flaw in D.S.I.R. finance with regard to research associations. He showed how the £1/£1 ratio of industrial subscription to Government grant tends to be altered as the years pass; by 1924 industry contributed £113,000 to research associations, and D.S.I.R. grants totalled £100,000; but by 1938 subscriptions had risen to £326,000 whereas the D.S.I.R. gave only £177,000. He suggested that for these research associations to receive proportionately less was not sufficient encouragement of applied research by the Government. He stressed the importance of research associations to British industry, pointing out that in 1936 only 18 per cent. of workers were in factories employing 1000 or more operatives, whereas 52 per cent. were with firms employing fewer than 250 workers. The relative meagreness of Government support to research was emphasised. Sir Granville referred to our daily non-productive expenditure of £13¾-14 million on the war, and called for an increase of £5-15 million a year in Government grants for research.

University Salaries

Sir Granville Gibson and many others brought the question back to the fundamental problem of education, which will have to provide scientists and technicians in greater numbers. The case for greater financial assistance to the universities to enable them to meet this demand for qualified scientists was well stated by Mr. Edmund Harvey, who represents the combined English Universities. He spoke of the low salaries paid at the universities, and to the difficulties under which teaching and research is carried on. In support of the second point he read from a letter received from a person "doing remarkable work in a responsible position" in a university: it read "Members of science and medical faculties are ill-paid and overemployed with teaching and sometimes routine duties. . . The opportunity for good investigation work has often to be fought for, and this struggle is a waste of energy and time. . . The position is so bad that we have lost some of the capacity or the wisdom or the courage to see and to ask for what would be adequate." To cope with the "vast arrears" of teaching that will have to be made up at the end of the war, when Service men and women who have been deprived of their opportunity of study, university staffs must be increased. The universities will need increased capital equipment, as well as increased annual help to meet the regular charges on them.

Captain Plugge suggested that the D.S.I.R. might form the useful nucleus for a Ministry of Arts and Sciences, similar to that existing in most democratic countries. The need for central planning of science was also touched on by Dr. Haden Guest, who wanted the Scientific Advisory Committee of the War Cabinet—comprising the Lord President of the Council, the president and the two secretaries of the Royal

Society, and the secretaries of the D.S.I.R., Medical Research Council, and Agricultural Research Council—to plan the main outline of research work, and to say what money would be required. To quote Dr. Guest's exact words " Only men of the calibre of those who are on the Scientific Advisory Committee are in the position to make this contribution to the planning of research. . . . They are in a better position also to say how much should be paid to scientific research workers than are some Members of this House. . . . If this were done and the Scientific Advisory Committee were asked to prepare a plan of research and development—say, for the next 10 years—and to state what amount of money ought to be allocated to the different departments of research, we should get a scientifically conceived plan."

Mr. James Griffiths spoke of Britain entering a new industrial age in which science has an even greater part to play than before. He wanted more research done on coal, leading to greater utilisation of this mineral. He regretted that Britain would have little experience of synthetic rubber production, and hence our scientists were losing the opportunity of learning the various things that are learnt in the making of synthetic rubber. It was a great pity that the proposal to make this material from carbide was not put into effect.

Underpaid Staffs

Mr. Owen Evans thought there was a lack of knowledge about native raw materials and mineral resources in Britain and our Colonial Empire. Insufficient money was spent on geological surveys. Turning to coal, he said he was definitely amused at the pride with which it was announced that the whole of the coal owners of Britain were to spend £500,000 over a period of 5 years to investigate coal utilisation. He did not hesitate to call that paltry and niggardly, £500,000 representing less than one per cent. of the total turnover of coal. Mr. Evans considered that the D.S.I.R. underpaid its staff, and referred to the currently advertised post for superintendent, of the Metallurgy Department of the N.P.L. for which the salary offered is " up to £1250 a year, but the starting salary would depend upon qualifications and experience." The Government, he said, cannot get men of real genius unless they pay them adequate sums of money and put them on an equal footing with administrators in the Services.

Sir George Schuster made a very effective speech in which he asked for generous treatment of universities and technical schools (he emphasised that their staffs should have time for research). He argued that education alone was not enough, however. Industrial scientific careers must be made sufficiently attractive. What was needed was a constant interchange—a two-way traffic—of pure scientists and practical men. He did not want the former to lose anything of their pure scientific quality, and he wanted the latter to remain frankly utilitarian but we did need a "mix" of the two, and in this mix a man who could act as a catalyst, capable of seeing what one side meant to the other, and of producing results. Sir George concluded by advocating that the Government should consider the provision of grants for pilot plant tests of techniques such as the Fischer-Tropsch process.

The Government Reply

Replying for the Government, the Lord President of the Council (Mr. Attlee), said they were in full sympathy with the terms of the motion, which was in accord with Government policy. He paid a tribute to the work of scientists during this war. He considered that science should not be something suggested as a kind of afterthought; we should be utilising scientific methods right through all our activities of Government and of industry. The Government recognised the need for a fund to be established to meet the cost of developing new inventions and testing new ideas for industry. How this could best be fitted in with the work of the co-operative industrial research organisations would have to be considered, and the matter was already receiving the Government's attention. With regard to grants for the universities, Mr. Attlee said the University Grants Committee was not tied down narrowly by the Treasury; he thought the universities had been perhaps too hesitant in the past to seek Government financial aid. While recognisng our need for better educational facilities in science, the speakers suggested that they must also ensure that there was no overstocking the market by providing too many scientific workers.

Mr. Attlee, continuing, agreed that scientists' salaries had been insufficient in many cases. The Government had already taken steps to raise the remuneration of the heads of research institutions. It had been suggested that we should have a Ministry of Science. He thought that would be a great mistake; once we had that, other administrations would say " This is a scientific thing. It belongs to the other Department." What was needed was the presence of persons trained in science in every Department. This policy of encouraging research needed the support of the Government, industry and the general public. There was a tendency to support things with money in war and to have a cold fit of repentance afterwards, and he hoped that the work now being done would be sufficient to prevent such an occurrence.

FUEL ECONOMY IN THE CHEMICAL INDUSTRY

Fuel Efficiency Lectures

IX—Evaporators

by J. W. GROSE

THIS address is limited to certain aspects of evaporation and particularly to steam economy. There is a surprisingly widespread belief that concentration under vacuum is essentially more efficient than concentration under atmospheric pressure. It is true that operation under vacuum is often conducive to fuel economy and where vacuum may be required for other reasons (*e.g.*, reduction in evaporation temperature), but the fact remains that in general a properly designed non-vacuum evaporator is more economical than a vacuum evaporator. The fundamental reasons for this are similar to those which have resulted in the marked tendency during the last 30 to 40 years to increase steam boiler pressures, namely, that: (1) the heat necessary to raise water to its boiling point is usually only a small percentage of the heat necessary to evaporate it; and (2) the higher the pressure the lower the latent heat of evaporation.

Table 1 shows the heat required to evaporate 1 lb. of water fed to a single-effect evaporator at 15°C. The figures show without a heater a saving in favour of vacuum of 4 per cent., but this is only part of the story.

TABLE 1
HEAT TO EVAPORATE 1 LB. WATER FED AT 15°C.

	Non-Vacuum		27 in. Vacuum	
	Without Heater C.H.U.	With Heater C.H.U.	Without Heater C.H.U.	With Heater C.H.U.
Sensible Heat	85	10	30	10
Latent Heat ...	539	539	570	570
Total	624	549	600	580
	113.5	100	109.2	105.6

It is a simple matter to provide a single-effect non-vacuum evaporator with a preheater utilising some of the water evaporated to preheat the feed nearly to boiling point before it enters the evaporator, thereby economising in live steam. In commercial practice it is quite easy to preheat to within 10°C. or less of the boiling point, that is, to 90°C. in this case. The total heat required is then reduced to 10 plus 539 = 549 C.H.U., 8½ per cent. less than under vacuum (Table 1).

Again you will interrupt to say that the same can be done with a vacuum evaporator. So it can, and the result, taking the same conditions as before, is 10 plus 570 = 580 C.H.U., a result which is still in favour of non-vacuum evaporation by 5 per cent. In practice, however, a preheater is not often fitted to a vacuum evaporator since the temperature difference between the vapour and the feed liquor is relatively low, and the cost of the preheater is high in relation to the work it performs. It will be noted that even if the feed temperature is 45°C., the boiling point under vacuum, the non-vacuum evaporator still has the advantage.

A well designed non-vacuum evaporator, therefore, has a lower steam consumption than one working under vacuum, and taking into account thermal efficiency alone, practically the only occasions when vacuum operation is advantageous are when it permits the utilisation of low-pressure steam which would otherwise go to waste. For example, if steam at atmospheric pressure or thereabouts is available from a process or steam engine, it cannot be used for evaporation at atmospheric pressure but it can readily operate a vacuum evaporator.

Apart from lower steam consumption there are further points in favour of non-vacuum operations: (1) low initial cost; (2) no cooling water required; (3) absence of vacuum pumps; and (4) exhaust vapour utilisable elsewhere. Nos. 1 and 2 speak for themselves. No. 3 carries with it the advantage of reduced maintenance costs as well as lower power consumption. No. 4 is a very important feature, the advantages of which deserve wider recognition. The quantity of vapour used in the preheater

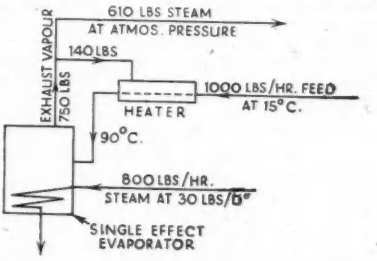

Fig. 1.

for preheating the feed, of course, varies in accordance with the weight of feed liquor in relation to the weight of water evaporated, but in general it is only a small percentage of the total water evaporated. The balance is available as exhaust steam at atmospheric pressure, and can be used for a variety of purposes, *e.g.*, heating of process liquors, operation of vacuum evaporators or driers, of buildings, etc. The last mentioned is a particularly interesting application at the present time. There must be many users of vacuum evaporators who are

throwing down the drain vast quantities of heat which would be more than ample to look after the heating of their buildings.

As a typical example, assume (Fig. 1) that 750 lb. of water have to be evaporated from 1000 lb. of liquor at 15°C., using steam at 30 lb./sq. in., in a single-effect non-vacuum evaporator with feed preheater utilising some of the vapour evaporated. The quantities are approximately as follows :—

Steam consumption	800 lb. at 30 lb./sq. in.
Water evaporated	750 lb. at 30 lb./sq. in.
Vapour condensed in preheater	140 lb. at 30 lb./sq. in.
Nett exhaust vapour	610 lb. at atm. pres.

It will be seen that an expenditure of 800 lb. of steam not only performs the necessary evaporation, but also gives rise to 610 lb. of exhaust steam (75 per cent. approx. of the live steam used) which can carry out further useful work. The results are very similar in multiple-effect evaporation; that is to say, in general there is no thermal advantage in working the last effect under vacuum; on the contrary, there are the same advantages as with a single effect in working non-vacuum.

There are many industrial processes which involve the extraction of raw material by the percolation of hot water, the resulting aqueous extract being concentrated in a multiple-effect evaporator. If the last effect works under vacuum, all the heat in the exhaust vapour goes "up the spout" or rather "down the drain." But if the last effect works non-vacuum, the heat in the exhaust vapour can be usefully employed in heating the extraction process. A case in point is the manufacture of tan extract, for which purpose triple-effect vacuum evaporators are widely used. If the triple is replaced by a non-vacuum double-effect, the exhaust from the second effect provides ample heat for operation of the bark-extraction plant and there are not only savings in capital and maintenance costs, but in addition the steam consumption of the process as a whole is reduced.

Factors in Steam Consumption

It is as important to look after efficient preheating of the feed in a multiple-effect as in a single-effect. Owing to poor design in this respect there are many triple-effects in operation which consume as much steam as a well designed double-effect, or even more. Also in comparing the performance of one installation with that of another it must be remembered that there are many factors governing steam consumption in addition simply to the number of effects and arrangement of preheaters. One of these is the temperature range or temperature drop, *i.e.*, the difference between the temperature of the heating steam and that of the vapour leaving the last effect. The smaller this drop the higher the efficiency and vice versa. Another factor is the percentage evaporation, *i.e.*, the percentage of water evaporated from the feed liquor. The higher this percentage is, the lower is the steam used per unit of water evaporated. Thus, without analysing the conditions of operation, it does not mean much to say that a certain triple-effect evaporates maybe 2.5 lb. of water per lb. of steam, while another gives a ratio of only 2.2 to 1.

It is impossible here to cover all the varied conditions met with in practice, but Table 2 may be of interest. It compares performances of vacuum and non-vacuum evaporators of modern design, using vapour for preheating but without any special adjuncts such as heat exchangers to boost the steam economy to the limit. It is assumed in all cases that the liquor feed temperature is 15°C., and the evaporation 75 per cent. of the feed. The steam pressure is 40-50 lb./sq. in. for the non-vacuum type and 10 lb./sq. in. for the vacuum type, in the latter cases the vacuum in the condenser being 27 in.

TABLE 2
STEAM CONSUMPTION OF MULTIPLE EFFECT EVAPORATORS
(Pounds of Water Evaporated per pound of steam)

Number of effects	Vacuum	Non-Vacuum
Single Effect	0.86	0.92
Double Effect	1.65	1.79
Triple Effect	2.41	2.59
Quadruple Effect	3.10	3.36

Brief mention may be made of the most suitable type of evaporator for non-vacuum operation. I have in mind, of course, the continuous film evaporator which has, among other advantages, the very important one of extremely short time of contact of liquor with the heating surface. Instead of boiling for maybe many hours, thereby undergoing a prolonged stewing action, the liquor in a film evaporator is concentrated continuously from the initial to the final density in a matter of minutes. This is an extremely advantageous feature, since experience over many years with a variety of different products has conclusively shown that the time factor in preventing damage to quality is always important, often more important than temperature of evaporation.

Of course, there are many liquors, especially food products such as milk and gelatine, which must be concentrated at low temperature. Such liquors are best dealt with in film evaporators working under vacuum which combine the advantages of low temperature and short time of contact. Enough has been said, however, to show that non-vacuum evaporation has many advantages and many fields of application, and is not merely of academic interest on account of its higher thermal efficiency.

Discussion

Q. Could the use of superheated steam for evaporation purposes be discussed ?

A. The Ministry of Fuel and Power has issued a Bulletin on the subject in which it is pointed out that almost always superheated steam should be used for evaporation or distillation. Superheated steam is unsuitable for heating purposes, because (1) it is a gas and as such gives a low rate of heat transfer, and (2) the quantity of heat available as superheat is small in relation to the latent heat.

Q. The lecturer has shown that the fuel consumption is less for evaporation under atmospheric pressure than under vacuum. Can it be deduced that evaporation under pressure is still more favourable thermally ?

A. Yes, certainly, because the latent heat is less at higher pressures. But since the temperature of the liquor is higher, the deduction is only true when the heat in the exhaust vapour is used for preheating the feed.

Use of Steam Ejectors

Q. A previous address on the production of vacuum has given the impression that the most reliable method of producing a vacuum is by a steam ejector, but that this is thermally inefficient because the exhaust contains a great deal of heat at low temperature which often cannot be used. Is not the inefficiency of the vacuum production plant a more powerful argument against unnecessary vacuum distillation than the lecturer's figures ?

A. Steam ejectors are efficient as producers of a vacuum and overcome many of the troubles experienced with vacuum pumps. The maintenance costs are low and a great deal of the heat of the steam used can often be recovered. In a two-stage ejector, for example, the exhaust from the second stage can be used to heat the feed, and a surface inter-cooler can be used after the first stage, and heat recovered there for the same purpose. On the other hand, none of the energy put into a vacuum pump is recoverable unless the pump is steam-driven, in which case some heat may be recovered from the exhaust, and the overall efficiency may approach that of the ejector. Both with an ejector and a pump, however, energy is expended which cannot be fully recovered, and both should be avoided whenever possible. The paper endeavoured to explain that one of the advantages of non-vacuum operation was the absence of pumps, etc., but what is the most potent factor depends on circumstances. Each case must be considered on its merits.

Q. What had the lecturer in mind when he said that the less the temperature difference, the higher is the efficiency ?

A. The higher the pressure of the heating steam in relation to the pressure (or vacuum) in the last effect, the lower is the latent heat of the steam compared with that of the vapour exhausted to atmosphere (or to the condenser). Hence, the higher the pressure-drop, and consequently the temperature difference, the lower the efficiency in terms of weight of water evaporated per unit of steam and vice versa.

Q. What should be the temperature difference between the heating steam and the liquor evaporated ?

A. There is considerable variation, and no hard and fast rule can be given. The greater the difference the less is the heating surface required, and the lower the capital cost of the evaporator ; as against this the steam consumption may be slightly increased for the reason just given in reply to the previous question. There is a limit to the useful temperature difference and this, generally speaking, is 40° or 45°C. A common figure for a multiple-effect in practice is 20°C.

Q. What is the effect on heat transmission of using vacuum instead of pressure ?

A. Speaking generally, the lower the temperature of the liquid evaporated the higher is its viscosity. By the laws of heat transmission, the higher the viscosity the less is the rate of heat transfer. Heat transmission is thus lower under vacuum than under atmospheric pressure. Therefore, it is advantageous to work at the highest temperature possible consistent with the nature of the material handled.

Q. Is it not a fact that the rate of formation of bubbles, and therefore the rate at which the liquid is agitated, has a great deal to do with the rate of heat transmission ? Should not, therefore, the temperature be as high as possible, in order that the bubbles may form faster ?

A. Yes, but rate of heat transmission is not a function only of temperature as such, but also of temperature-difference. There might be a temperature-difference high up the scale above 100°C. or low down the scale below 100°C. For example, if an arbitrary temperature-difference of 30°C. was allowed, one could use steam at 130°C., with a liquid boiling at 100°C ; in another case the liquid could be 45°C., and the steam 75°C. At the lower temperature range the liquid would be more viscous and, therefore, other things being equal, the rate of heat transmission would be reduced.

Material of Vessels

Q. What is the comparative efficiency of heat transfer for evaporating purposes as between an enamelled vessel and a stainless steel vessel ?

A. A great deal depends upon the material evaporated, and on the design of the evaporator. On account of the low heat conductivity of the enamel there would in general be a lower output with an enamel lining than with stainless steel. In an evaporator, however, the overall heat transmission is usually governed more by the conditions on the liquid side than by the exact thickness and the nature of the tube or dividing wall, so that the latter are modifying rather than deciding factors in the overall performance.

Q. When utilising waste heat from a tubular evaporator is the rate of evaporation lowered by not allowing the steam to escape quickly ? Is any back pressure caused ?

A. The back pressure is only a few inches of water and has no effect upon the performance. One only has to consider the first effect of a multiple-effect evaporator, which usually operates above atmospheric temperature in the vapour space.

Q. In a multiple evaporator system the boiling point rises during concentration. How is this difficulty overcome ?

A. With a liquid having an appreciable boiling-point elevation and where there are definite limits for the initial steam temperature

and the final temperature in the last effect, the temperature-rise due to boiling point has a very serious bearing on the number of effects which can be used.

Suppose steam is available at 45 lb. pressure (145°C.), and consider a multiple-effect evaporator working non-vacuum. There is then steam at 145°C., and an exhaust at 100°C. That is 45° temperature-difference. With a liquid which has no boiling-point elevation it would be quite reasonable to put in a triple-effect with an average 15° drop on each effect. But with a liquid having an initial B.P. elevation of 5°C., going up finally to say 15°C., an average of 10°C., then the effective drop is reduced by 10° in each effect. This would leave an effective drop averaging only 5° in each effect of a triple, which would hardly make a practical proposition and probably would result in the use of a double-effect instead.

Q. When hot condensate above 100°C. is discharged at atmospheric temperature, even if used subsequently for boiler feed, is not flash steam lost?

A. Yes. Those interested should read the Ministry of Fuel Bulletin No. 28, "Flash Steam and Vapour Recovery."

Q. What is economy of evaporation in a boiler with utilisation of the steam as compared with evaporation, using an evaporator? Some steam from this boiler at 40 lb. pressure is used for process work.

A. Provided the boiler is efficient and all the steam raised can be usefully employed, this system is certainly efficient. If all the steam is not being used, then the efficiency could be improved by making the boiler the first effect of a multiple-effect. This idea is not new and has already been used in practice. It must be remembered, however, that some liquors might corrode the boilers, others might decompose from overheating, while with others there might be priming or entrainment difficulties.

Efficiency of Coil Heaters

Q. What is the relative efficiency of the coil type of heater as compared with batch type evaporators from the point of view of fuel?

A. With equally good lagging there is little difference between an evaporator with a coil and one with straight tubes. If, however, the comparison is between a direct-fired coil heater, for example a pipe still, and a steam-heated evaporator, then a great deal depends on the working temperature in the pipe still and the use, if any, made of the waste hot gases leaving the still. When distilling oils the efficiency might be 50–60 per cent. or less, whereas the efficiency of a good boiler and evaporator might be 75 per cent.

Q. What is the value of vapour recompression?

A. Whilst it has several excellent uses there are limitations especially in the chemical industry. To get a high efficiency with vapour recompression it is necessary to work with a relatively small pressure or temperature-drop and this involves a large heating surface for evaporation, especially if the liquor is at all likely to form scale. There is so little margin of temperature-drop available that a small degree of scaling may be quite fatal. On the other hand, with liquors which are not of a scaling nature or have not a high boiling-point, vapour recompression is very frequently of great value. It can be applied with advantage to the first effect of a double effect and will give triple-effect efficiency or even better.

Treatment of Condensate

Q. In considering the efficiency of feed heaters, should not the sensible heat in the condensate from the evaporator be included.

A. There are really two points involved: (1) the steam condensed in the first effect, and (2) the steam condensed in the following effect. From the point of view of boiler efficiency, it is often best to return to the boiler only the condensed steam from the first effect. But where the condensed vapour from the other effects is not contaminated with impurities from the liquor handled, it is possible to pass the condensed steam from the first effect into the second effect and on to the third and so on, and in that way recover quite a lot of heat from it. Where it is necessary to return the steam from the first effect separately, then, if it is a large plant, some of the heat from the condensed steam should certainly be recovered (*e.g.*, by a heat exchanger), bearing in mind that the lower the temperature of the condensed steam returned to the boiler, the more heat there is to be put back into the boiler.

Q. In cooling the condenser in the last stage of multiple-effect evaporators, is it necessary to use refrigeration?

A. Yes, if cooling by ordinary methods is out of the question, *e.g.*, if the cooling-water temperature is excessive. There are water-cooling devices, operating with a high vacuum maintained by a steam ejector pump, which cool the water by flashing off vapour under high vacuum.

A speaker remarked that in American oil-fields, where enormous quantities of cooling-water are required, refrigerators of this type were used in order to run the cooling equipment more efficiently. The degree of vacuum used for this purpose depends on the temperature required; the lower the temperature the higher the vacuum employed. The system is chiefly applicable when large quantities of water have to be cooled by a small amount and is seldom used for temperatures below 40°F.

Q. Is there not some confusion as to the definition of efficiency? If the usual method used with boilers (*i.e.*, the theoretical requirements for heating the water and evaporating it, divided by the total heat in the fuel) is applied to a multiple-effect evaporator, what efficiency figures are obtained for an evaporator of various effects, *i.e.*, single, double, and so on, as distinct from the lb. of water evaporated per lb. of steam?

A. It is hardly possible to measure evaporator

efficiency in exactly the same way as for a boiler, because, while a boiler is a generator of steam, an evaporator is only a "transformer." It takes the latent heat in the steam supplied to the first effect and roughly speaking transforms it in the following effects into an approximately equal weight of steam at successively lower pressure and temperature levels. Evaporator efficiency is sometimes expressed on a percentage basis, but the method is apt to be misleading. For example, the efficiency of an evaporator evaporating 2 lb. of water per1 1 lb. of steam would be 200 per cent. approximately. A similar state of affairs occurs with refrigerators where the efficiency is measured by a "co-efficient of performance" rather than on a percentage basis. Another parallel case is that of the thermo-compressor.

SAFETY FIRST

Fire Risks and Post-War Industry—III

by JOHN CREEVEY

DURING 1939, when industries were still operating at only peace-time pressure, nearly 27,000 fires were reported at industrial plant in the United States, and the loss exceeded 50 million dollars, or roughly 10 million pounds sterling; this loss was sustained in spite of the fact that fire prevention had been actively taken in hand, simultaneously with the expansion of industries in the United States, since the formation of the National Fire Protection Association in 1896. Comparable figures for Great Britain cannot be given; but the position in the United States suffices to point to the necessity for closely observing all that appertains to fire prevention in post-war years. We may certainly presume that new industries will then be developed and have their fire risks, while changes in processes and equipment will make it illusory to continue to depend for safety on old fire-extinguishing methods. That the development of an industry brings new fire risks is evident from a review of the manufacture of synthetic fibres and lacquer finishes during the five years before the war.

Analysis of Hazards

In every industry the primary step in fire prevention is to analyse the hazards and then adopt the best safeguards; with precise knowledge of how most fires start, employees in any particular industry can be trained better to deal with these fires, as distinct from fires in general; not that the latter are to be ignored, but for the good reason that fire-fighting methods are never likely to be reduced to a simple set of rules common to all industries. In no case, however, will the most efficient fire fighters, armed with the best equipment, ever remove the danger of an outbreak; there must be continuous supervision of the works to eliminate careless habits and all unnecessary hazards.

At soap works, for instance, grease-saturated fullers' earth accumulating from the bleaching of fatty oils is liable to give trouble by spontaneous combustion; as may animal charcoal which has been used in deodorising edible oils. Linseed oil, a raw material at paint works, is also a danger from spontaneous combustion, especially under conditions which appear *un*favourable, as when the oil is merely in contact with damp wood in open air, despite continuous surface cooling. The risk of fire under these conditions is increased when turpentine or some other volatile liquid is present. Fires at paint works, originating primarily in conditions conducive to the spontaneous combustion of linseed oil, have been proved due to the high "drier" content of a batch of product in course of manufacture, to the extreme fineness of pigment aiding some catalytic action caused by impurities, to the development of excessive heat (by abnormal friction) in roller mills, and to the temporary stopping of roller mills in circumstances favourable to oxidation of the linseed oil present.

Storage Dangers

At rubber works the storage of the raw rubber needs particular care; raw rubber begins to evolve inflammable vapours at a temperature of 135°C.; between 310° and 315°C fusion starts, with active decomposition, the products being extremely inflammable. Sparks from static electricity, built up by the flow of non-conducting solvents in pipes, have been the origin of a considerable number of fires at rubber works; the hazard is greatest at the time of least humidity, and although an efficient earthing system for all pipework may have been provided, it is advisable also to avoid a deficiency of moisture in the atmosphere. At tanneries, the storage of large quantities of unslaked lime can be hazardous. There are also storage hazards at soap works, where the raw materials include rosin (used to increase saponification), as well as fats (mainly tallow), and fatty oils (animal, vegetable and fish).

Where new works are being built, a considerable element of fire risk can be eliminated by suitable choice of structural mate-

rials and careful planning, but no building construction can be regarded as absolutely fireproof, if a fire becomes sufficiently fierce. Nevertheless, "fire-resisting" materials are available; including materials which will also avoid retention and percolation, thus eliminating another hazardous condition. At some soap works, for instance, there is certainly no excuse for wood floors in certain buildings, where, by long usage they may become saturated with fatty oils or with rosin, and so provide an extremely inflammable structure. Likewise, by precluding the use of wood floors, it should be easier to avoid the percolation of fatty oils which drip upon uncovered steam pipes, where the temperature may be as high as 315°C. With such conditions as these, is it to be wondered that fires break out and make rapid progress before they are discovered?

Fire heat is preferably avoided wherever it is possible to use steam; the menace of fire-heated equipment is well illustrated in soap boiling, where the contents of a pan may easily boil over if conditions are not properly under control, fire troubles coming as soon as the oily mixture reaches the fire box. Similar risks occur at tanneries, where it is usual to melt the currying waxes over an open fire; and in "gum running" at varnish works. It is mere commonsense to avoid passing the flue from a furnace through any structural material which is of a combustible nature, such as wood; however, there is still notable ignorance concerning the fire danger of pipes which carry steam at high temperature.

Changes in Processing

There are also numerous instances in industry where the conditions of processing change a harmless material into one which has distinct danger (either in its finished state or at some intermediate stage) should a fire occur; additionally, the condition attained by processing may have its particular fire-causing risk, which must not be ignored. Untanned skins burn with difficulty; but tanned leather, especially when "stuffed" with oils and fats, can be highly dangerous, not only as material to feed an outbreak of fire, but also from the fact that the oxidation of the oils and fats can favour spontaneous combustion. The subject of spontaneous combustion as a means of causing fires has never been investigated exhaustively.

Regarding exact procedure in dealing with a particular outbreak of fire (emphasising the need for employees to become conversant with the fire hazards of their particular industry), consider the "cooking" of linseed oil in varnish making. Occasionally, by some fault in heating, or otherwise, the oil reaches a temperature exceeding its ignition point, and catches fire. The resulting blaze cannot be extinguished with water; not even with water in form of a fine spray from a stirrup pump, for even a few drops of water coming in contact with the burning oil will cause much spattering by formation of steam, and the contents of the kettle will immediately froth and boil over. In these circumstances it is necessary first to cut off the source of heat (which is more difficult in the case of direct fire than with steam heat) and then cool the brickwork setting as rapidly as possible. This last operation can be done successfully by aid of the stirrup pump, taking care that none of the water is sprayed high enough to enter the kettle. Following this, if there is sufficient space in the kettle (assuming that the size of the batch does not exceed safe working proportions), cold linseed oil can be run in carefully until the temperature is reduced below ignition point and the fire is extinguished. Inert gases, however, such as methyl bromide or carbon dioxide are the best extinguishing agents, as there is no danger from spattering; but even here, if the oil is very hot it may reflash after being extinguished, and further applications will be needed to reduce the temperature below ignition-point.

SWEDEN'S OIL AND COLOUR INDUSTRY

The difficulty of supplying Sweden with imported raw materials for the oil and colour industry has increased with the spread of war, and domestic production has accordingly expanded. Oil paint is now being manufactured on a casein basis; and although this product has by no means the same resistance to climatic influences as that based on linseed oil, and does not afford sufficient protection against corrosion, it is pointed out that it may yet find a market even after the war. Great progress is said to have been achieved in the manufacture of synthetic paints and varnishes. Consumers have now become used to these new products and it is expected that foreign competition, especially American, will be less severe after the war. Swedish synthetic products have greatly improved in quality, and are now considered the equal of those of foreign manufacture.

In the field of dry colours, however, no domestic production has been undertaken, and Sweden still depends on imports. On the other hand, solvents, imported before the war from Germany and the U.S.A., are now being manufactured at home, and the quality of the product is reported to be high. Imports of coal-tar by-products, such as creosote and anthracene oils will have to be resumed, as the substitutes, based on wood-tar, are not as satisfactory as their prototypes, and their cost of production is substantially higher.

Association of Tar Distillers

Annual Report

THE report of the Association of Tar Distillers for the year ended December 31 begins by referring to the continued maintenance of the increased demand for practically all tar products. Although chiefly concerned with the proper representation of the industry's views to, and co-operation with, the Coal Tar Controller, the Association has maintained its close contacts with the various appropriate Government departments, trade associations and other bodies.

New committees formed during the past year were: *The Policy Sub-Committee*, formed to prepare recommendations meeting members' expressed wishes on various aspects of organisation of the industry. *The Organisation of Research Sub-Committee*, constituted to review the whole question of research and to indicate the broad lines of an organisation for carrying out co-operative research within the industry; and a *Joint Committee with the Ministry of Fuel and Power*, consisting of representatives of the Ministry and the Association to consider the post-war problems of the tar distilling industry.

The National Transport Committee has had under investigation the pressing problems of transport with particular reference to ensuring the most efficient working of rail tank wagons. The committee has placed before members through the regions urgent reasons why they should endeavour to obtain the utmost possible efficiency in rail wagon workings, and returns show that a definite improvement has been achieved. The committee feels, however, that with the continued co-operation of the regions still better working returns may yet be obtained.

Tar Confederation

During the year, the plans for a body representative of both producers and distillers of tar developed steadily, and a stage arrived when the representative organisations appointed members to a drafting committee to prepare a constitution for such a body, under the name of the British Tar Confederation. This committee had nearly completed its work by the end of 1943.

The book on Coal Tar Fuels of the year will be published in the course of the next two or three months.

The Coal Tar Bituminous Products Sub-committee has continued active investigation of new uses for pitch in connection with constructional work. It is envisaged that the committee's recommendations in these directions will result in the opening-up of permanent new markets for pitch. The Association continues to be actively represented on the B.S.I. committees which are preparing specifications for such tar products.

Phenol Production

The extraction of tar acids and the production of phenol has been developed through the co-operation of the industry with the Controller to such an extent that, at the conclusion of 1943, it would appear that production was at least temporarily in excess of the then essential *plus* permitted usage. The Controller called on the producers and merchant exporters of cresylic acid to co-ordinate their business interests in supplies to the U.S.A., and this resulted in the formation of a single marketing company, Pamtas, Ltd.

Representatives of the Toluene Sub-committee continued the discussions, noted in the last annual report, with the Ministry of Supply, with a view to securing increases in controlled prices. These negotiations came to a satisfactory conclusion with the issue of the Control of Toluene (No. 3) Order, 1943.

Standards

The Association continued its collaboration with the British Standards Institution. During the year this centred largely round the work on tar substitutes for bitumen, mentioned above. The Chemical Division of the Institution was completely reorganised during the year, and a Tar Products Industry Committee, composed exclusively of representatives of the Association and of the Association of British Chemical Manufacturers, was set up. This committee will consider and decide the action to be taken on all proposals for standardisation of tar products. While technical committees fully representative of producer, consumer, etc., interests will draft specifications, the Industry Committee will be finally and actively responsible for approving such specifications before publication.

Early in the year an inquiry, in the form of a questionnaire, on certain basic proposals relevant to the post-war policy of the industry, was circulated to all members. A Policy Sub-committee was appointed to make a report and recommendations for the Executive Committee in the light of the views received. The sub-committee in due course issued its report on the future policy of the tar distilling industry, copies of which were circulated to all members. Comments and alternative proposals on this report were invited, and at the end of 1943 the replies were under consideration by the Executive Committee.

Science in Industry

Manchester Gives a Lead

THE formation of a Joint Standing Council representing Manchester's University and Chamber of Commerce, and having for its objective the closer relation between science and industry, was proposed on Thursday last week by Mr. A. H. S. Hinchliffe, president of the Manchester Chamber of Commerce. He was presiding at Sir Edward Appleton's address, the last of a series on "Science and Industry."

These addresses, Mr. Hinchliffe said, had emphasised the need for liaison between the scientists engaged in research and the industrial and commercial world. The juxtaposition of a great university and an area containing an ample diversity of industrial activities seemed to offer a unique opportunity. The university, he knew, could produce the research workers, while the ancient chamber, born in 1820, could provide the industrial and commercial experience. Accordingly, the university and the chamber, through the persons of Sir John Stopford (the vice-chancellor) and himself, had been discussing the formation of the proposed council, which, it was intended, should be an advisory and consultative body. It had been proposed to ask the Cotton Industry Research Association whether their director, Dr. F. C. Toy, would serve on the joint council.

Functions of the Council

Mr. Hinchliffe considered that it was too early to define the council's precise functions, but it was hoped that the results of research work could be constructively examined and discussed, and the workers given the benefit of access to the experience of firms in the area. At the same time people would be assisted in their quest for new knowledge and in the solution of technical difficulties. It might even be possible to establish an information bureau where "anyone could be put on the track of technical knowledge," and the general aim would be to stimulate the advance of thought and encourage enterprising action.

Sir Raymond Streat said that if the meetings had done no more than open the way to the proposed new liaison, they had achieved a memorable success. He pointed out that our economic future would depend less on pioneering expansion than on supreme skill in making the best use of each unit—of humanity, of land, of material, and of capital. The interest evoked by these meetings showed that industry and commerce in Lancashire were alive to the fact that it was by a true and fertile marriage between science and industry—and by that alone—that we could establish and maintain the margin of superiority essential to our prosperity. We should have in mind three main objectives, he suggested: to be first with new inventions and promptest with their application; to be quickest and surest in the diagnosis of economic and technical trends; and to be foremost in economising costs. Referring to the smaller firms, he stated that he was far from taking the view that the age of research implied disaster for them, though we ought, in years to come, to keep open minds as to the ideal size of industrial units. Owners and managers of small concerns should make use of the research associations in a really thorough manner; and if the research associations were provided with enough funds to maintain a liaison staff adequate to afford assistance to small firms, the latter should be able to keep their end up.

LETTER TO THE EDITOR

Scientific Information

SIR,—I am grateful to my friend Mr. Lancaster-Jones for his attempt to clarify the article on "The Availability of Scientific Information" which you were so good as to invite me to contribute, and which appeared in your issue of April 8.

Mr. Lancaster-Jones does not state clearly what misconceptions he thinks that article is likely to create. It is natural he should see the matter only from the viewpoint of his library. But, although I had the honour to build up the Science Library, in some measure, as a centre of scientific information, I had in mind, both then and now, the general problem of making scientific information available. I refrained from reference to the fact that the Library bibliographical service, organised partly with a view to such an occasion as the present, has been depleted, when it could, perhaps, have been most useful.

Far be it from me to interfere in the autonomy of any bibliographical concern. My thesis is that, given the demand, a comprehensive information service could be instituted, by co-operation of autonomous institutions working with a comprehensive index to the literature. Presumably, participating agencies would themselves decide what changes might be needed. To this dual project I shall continue to devote my energy; and the support of those who realise the great importance of the task will be most thankfully accepted.—Yours faithfully,

S. C. BRADFORD,
Vice-President of the British Society for International Bibliography,
Keeper of the Science Library, retired.

Parliamentary Topics

Power Shortage : Idle Time

SIR GRANVILLE GIBSON asked the Minister of Labour what was the financial responsibility of a firm towards its employees, under the Essential Work Order, in cases where the restriction of the motive power of such a firm, derived from purchased gas or electricity, resulted in reduction in hours of employment of the employee. Mr. Bevin said a firm scheduled under the Essential Work Order was under a statutory obligation to pay time-workers the normal wage for the normal working week, and for the normal working day in the case of piece-workers, if the worker is capable of and available for work and willing to perform alternative work which he can reasonably be asked to perform when his own work is not available. As a rule, said Mr. Bevin, the necessary reduction in power consumption could be achieved without causing idle time. In exceptional cases where this was not so, applications for permission to discharge staff, subject to a week's notice, would be considered by the National Service Officer. Mr. Bevin also suggested that such emergency restrictions of power would not last for any great length of time.

Dispute at Steel Works

Mr. Shinwell asked the Minister of Labour about the dispute at Hallside Steel Works, Lanarkshire. Mr. Bevin said his officers were in touch with both parties to this dispute, which arose because of the need to make a substantial reduction in the labour force employed there. He was arranging for an independent inquiry so that the facts could be clearly ascertained.

Palestine Chemical Imports

Mr. Liddall asked the Secretary of State for the Colonies in the House of Commons to what extent I.C.I. were now the sole importers licensed by the Palestinian Government for the import of certain chemicals; and whether such imports related solely to chemicals manufactured by I.C.I. or whether the licence covered other chemicals imported by I.C.I. but purchased by them from their competitors in Great Britain. Colonel Stanley replied that he had made inquiry by telegram of the High Commissioner for Palestine and would communicate with Mr. Liddall on receipt of the High Commissioner's reply.

Paint Industry Control

Sir H. Williams asked the Minister of Supply if his attention had been drawn to the fact that, in the year following the concentration of the paint industry, the principal firm in that industry, Messrs. Pinchin, Johnson & Co., Ltd., had increased its profits from £453,000 to £553,000 and its dividend from 8½ per cent. to 10 per cent.; and whether any employees of this firm or of any of its subsidiaries are or were on the staff of his Ministry engaged in controlling the paint industry.

Sir A. Duncan pointed out that the paint industry had not been concentrated. A member of the staff of a subsidiary of the firm referred to was serving in the Miscellaneous Chemicals Control.

Sir H. Williams: Is it not the case that, although the industry has not, technically, been concentrated, the Government are routing orders so that only certain firms are privileged to receive the orders; that the Ministry of Labour has taken as much as possible of the labour employed by other firms, and that concentration has, therefore, been achieved not straightly but crookedly? —Sir A. Duncan: There is no foundation for any suggestion of that kind. There has been no concentration, straight or crooked.

Annual Meetings

The Chemical Society

THE 103rd annual meeting of the Chemical Society was held at Burlington House, London, on April 20. During the business, which took place in the morning, Professor W. N. Haworth, D.Sc., F.R.S., Nobel Laureate, was elected president, and Mr. E. J. Bowen, M.A., F.R.S., a vice-president. It was also announced that Dr. M. P. Applebey, Dr. M. P. Balfe, Dr. L. Hunter, Dr. E. R. H. Jones, and Professor W. F. K. Wynne-Jones had been elected ordinary members of Council. At 2.30 p.m., Dr. W. H. Mills delivered his presidential address entitled "Old and New Views on some Chemical Problems" and at its conclusion, Professor W. N. Haworth was inducted into the chair as president.

Manchester Dyers and Colourists

The annual meeting of the Manchester section of the Society of Dyers and Colourists, held on April 21, was particularly well attended. Dr. H. A. Thomas, who read the report in the absence, owing to illness, of the secretary, Mr. C. C. Wilcock, commented on the great increase in the activity of the section in comparison with the previous year. Pre-war standards of attendance at meetings had been attained, eight general meetings had been held, and membership had risen from 274 to 296, with corresponding increases among associates and junior members.

During the year two committee members, Mr. H. à Brassard and Mr. D. F. Harrison, had been obliged to resign, and the resultant vacancies were filled by Mr. F. Farrington and Mr. G. S. J. White. At the meeting, all the members of the com-

mittee were re-elected, and the retiring chairman, Mr. G. M. Williams, formally inducted Dr. H. A. Thomas as chairman for the ensuing two years. Mr. H. A. Adams proposed a hearty vote of thanks to the retiring chairman.

O.C.C.A. — London Section

At the annual meeting of the London section of the Oil and Colour Chemists' Association, held on April 21, the report made reference to the continuation of the policy of arranging post-Graduate lectures, inaugurated in 1941. During July, 1943, three lectures on "Physical Chemistry" were given by Mr. E. J. Bowen, M.A., F.R.S. The committee intends to continue the scheme during the coming session. During the year ended December 31 last there was a nett gain in membership of 34. The formation of the Hull section, an event which was warmly welcomed by all members of the London section, resulted in the loss of 47 members. Congratulatory reference was made to the formation of a Bristol section, notably to the energy of the honorary regional secretary, Mr. W. G. Wade. He and his fellow members had made remarkable progress.

The chairman, Mr. N. A. Bennett, had permitted the committee to nominate him for a second year of office, and thanks were accorded to him and to the honorary officers, who were unanimously re-elected. Mr. E. H. Davies and Mr. W. Garvie retired from the committee, Mr. D. H. Hewitt and Mr. J. D. Morgan being elected to fill the resultant vacancies.

Institute of Physics

Scottish Branch Inaugurated

PHYSICISTS employed in industry in Scotland have for some time felt the need of local opportunities for the interhange of knowledge and experience of applied physics. At their request the board of the Institute of Physics has therefore authorised the formation of a Scottish branch of the Institute, which is to be centred in Glasgow.

The inaugural meeting of the branch takes place at 2.30 p.m. on Saturday, April 22, in the Chemistry Buildings of the University of Glasgow. Mr. E. R. Davies, F.Inst.P., a vice-president of the Institute, and Director of Research, Kodak, Ltd., will deliver an illustrated lecture (to which visitors are welcome) on "High Speed Photography, and its Applications in Science and Industry." Further particulars of the branch may be obtained from the Acting Honorary Secretary, Dr. R. S. Silver, c/o Messrs. G. & J. Weir, Ltd., Cathcart, Glasgow, S.4.

RUBBER SPECIFICATIONS

War emergency revisions of Government specifications for vulcanised rubber and plain rubber tubing (T.G.25A and T.G.49) have been issued by the British Standards Institution under the numbers B.S.S. 1154 and 1155 (2s. each). These revisions have become necessary on account of the rubber situation and are designed to cover the purchase of materials by Service Departments for conditions where the normal commercial equivalents are not suitable.

It is understood that the rubber manufacturers will shortly suggest that the specifications be converted to the purpose of general-purpose synthetic rubber (GR-S) and the specifications have been so drafted as to provide that, with the change-over, the alterations can be incorporated in an addendum slip. Thus the two specifications, which will probably be continued after the war, will again be readily convertible to natural rubber.

NON-REFLECTING GLASS

A new kind of non-reflecting glass has been described in the U.S. Patent Office *Gazette* (Pat. No. 2,337,460) as a process of treating glass containing alkali metals, calcium compounds and silica to form non-reflecting films on the surface of the glass. The glass surface first is treated with a strong mineral acid to bleach out soluble alkalis and leave a surface rich in calcium and silica compounds. An adherent film then is formed, "highly rich," according to the description, in calcium fluoride through the use of the strong etching agent, hydrogen fluoride. The result would be a glass dully etched on one side and having high non-reflecting properties. The patent has been assigned to the Pittsburgh Plate Glass Company. The inventor is P. V. French.

FULMINATE DERMATITIS TRACER

To reduce the incidence of mercury fulminate dermatitis in the explosives industry, two workers in the U.S. Public Health Service have produced a liquid soap which, by a change in colour, shows the presence of traces of the mercury compound upon the skin. The soap contains: diphenylthiocarbazone 0.18 gm., triethanolamine 250 c.c., liquid soap 750 c.c., hydroquinone 0.015 gm. It is orange in colour, and in the presence of traces of mercury salts it changes rapidly to a deep, easily recognisable purple. The triethanolamine brings the mercury fulminate into solution and the change of colour is produced by reaction with the diphenylthiocarbazone. One drop (about 0.05 c.c.) of the reagent soap solution will indicate the presence of 0.000002 gm. of mercury.—*Chemical Industries*, Jan., 1944.

Personal Notes

MR. A. T. S. ZEALLEY, joint managing director of the Billingham Division of I.C.I., Ltd., was this week elected president of the Tees-side Chamber of Commerce.

SIR JAMES LITHGOW was elected president, and DR. ANDREW MCCANCE chairman, at the first meeting of the new British Iron and Steel Research Assocation. Immediate steps are being taken to appoint a director of research and a principal administrative officer.

F/O. WILLIAM BOOTH, R.A.F., of Widnes, who has been awarded the D.F.C., was a member of the I.C.I. Central Laboratory staff. He has 26 operational flights to his credit and was at one time reported missing after baling out over enemy territory last September.

The following have been elected Fellows of the Institute of Physics: W. J. CHALLENS, B.Sc., P. DOCKSEY, B.A., T. S. ENGLAND, B.Sc., K. MENDELSSOHN, D.Ph., M.A., R. H. SLOANE, D.Sc., and M. W. THRING, B.A. In addition, 13 Associates were elected, and seven Subscribers and nine Students admitted.

MR. W. F. NEWELL, B.Sc., A.M.I.E.E., A.F.R.Ae.S., has resigned from Sangamo Weston, Ltd., after over ten years' association with Weston Instruments, to take up the position of technical contracts manager with The Automatic Coil Winder & Electrical Equipment Co., Ltd., makers of the "AVO" testing Instruments and "Douglas" and "Macadie" coil winding machines.

DR. DUNCAN A. MACINNES, the well-known physical chemist, has been elected president of the New York Academy of Sciences. He is a past-president of the American Electrochemical Society. Among the six scientists elected honorary life members at the same meeting were PROFESSOR ALEXANDER FLEMING, discoverer of penicillin; SIR FREDERICK GOWLAND HOPKINS; and PROFESSOR T. SVEDBERG, head of the Physical Chemistry Institute, University of Upsala.

MR. and MRS. JOHN JAMES LATHAM, of Bold, Widnes, Lancs., celebrated their diamond wedding on April 16. Mr. Latham was associated with the Merseyside chemical industry for 52½ years, beginning his career in the laboratory of the British Alkali Works. In 1905 he became manager of the Sullivan works of the United Alkali Company, continuing after 1915 as manager of the United Pilkington-Sullivan concern. At the formation of I.C.I., Mr. Latham had completed 50 years in the chemical industry, but he served 2½ more years before his retirement in 1929.

MR. R. N. JOHNSON, M.Sc., F.R.I.C., has been appointed to the new post of Administrative Officer to the British Leather Manufacturers' Research Association.

MR. R. G. SIMPSON has been appointed deputy-chairman of the United Molasses Co., Ltd., MR. G. W. SCOTT joint managing director, and MR. C. G. ALLOTT secretary.

MR. T. H. MCLAREN, of Dundee, was elected president for the year at the annual meeting of the Textile Institute, held in Manchester last week. Until the outbreak of war he was managing director of Baxter Brothers & Co., Ltd., and he is now Deputy Flax Controller. The year's vice-presidents are: MR. F. W. BARWICK, MR. F. KENDALL, and DR. J. C. WITHERS, A.R.I.C.

CAPTAIN JOHN RITCHIE ALEXANDER, at present serving with the Black Watch (R.H.R.), has been appointed a director of Charles Tennant & Co., Ltd. He is the second son of the chairman and managing director, Brig.-Gen. Sir William Alexander, K.B.E., C.B., C.M.G., D.S.O., T.D., and his appointment marks the fourth generation of the family to be thus closely connected with the company. Before the war, Capt. Alexander served his apprenticeship in several of the works of associated companies and gained a training in the chemical industry. He has also been elected to the board of Synthite, Ltd., another of the Tennant group of companies.

Obituary

The death is reported of DR. DAVID GWYNNE DAVIES, lecturer in physical and inorganic chemistry at University College, Aberystwyth, at the age of 37.

New Control Orders

Mica

The Control of Mica (No. 3) Order, 1944 (S. R. & O. 1944, No. 448), which came into force on April 21, revokes, and remakes in consolidated form, with amendments, the Control of Mica (No. 2) Order, 1942, and its Direction No. 1. The principal amendments are that: (a) Built-up mica may now be dealt in without licence; and (b) Built-up mica may now be used as an electrical insulator (but not treated, used, or consumed otherwise) without licence.

Canadian Aniline and Extract Co., Ltd., is expanding its plant at Hamilton, Ontario. During the past year, four new distillation units have been installed for the production of basic chemicals used by the company. Work has started on the erection of the first complete unit for the production of oxalic acid, which sould be in operation within a month.

General News—From Week to Week

An electron microscope of the large R.C.A. pattern has just been installed in the Textile Physics Research Laboratory of Leeds University, states the *Yorkshire Post*.

Forty-two candidates were successful in the Spring Examination in General Chemistry for the Associateship of the Royal Institute of Chemistry.

Two hundred thousand persons, mostly women, will come within the scope of the Wage Board Order covering industrial and staff canteens. This information was given by Mr. Bevin on April 20 in reply to a question from Mr. Mander.

Output figures for open-cast coal were given by the Minister of Fuel last week. He said that little coal was obtained by this method before March, 1942. From the start of operations until March 31, 1943, 1,807,000 tons were recovered, and for the year ending March 31, 1944, this figure was 5,340,000 tons.

The Society of Public Analysts has authorised the formation of a Microchemical Group within the society. Members who wish to join the group should notify the hon. secretary. Those members who belonged to the Microchemical Club need not do so, as they will automatically be registered as members of the new group.

The Iron and Steel Control announces that the price of 0.50 per cent. max. carbon grade refined ferro-manganese has been reduced as follows for material despatched from producers' works or stock in the U.K. Basis Price: £77 10s. per ton, basis 78 per cent. Mn, scale 20s., delivered to buyer in minimum 5-ton lots. For smaller lots extra carriage may be charged by producers.

The Graduates and Students Section of the Institution of Chemical Engineers has appointed the following officers: *Chairman*, G. Colman Green; *hon. secretary*, R. W. Covill; *assistant hon. secretary*, R. G. Tongue. The committee for 1944 comprises the following members: *Industrial members*, R. Hayman, W. J. Grant, J. R. Pirie, T. A. Storrow, A. Rees Jones. *Student members*: E. T. Moss, A. W. Cowley, F. Kafga.

In a survey of non-enemy fires compiled for the National Campaign Against Fire Wastage, figures show that in the London region alone last year, there were 10,406 outbreaks to which the N.F.S. was called. Out of these, 4182 occurred on industrial premises. This works out at approximately one fire in every two hours. About 80 per cent. were preventible and carelessness in many forms was responsible for 45 per cent. of the total.

A lecture on plastics was given to Jarrow Rotary Club last week by Mr. W. J. Brown, works manager of the Bushing Co. Ltd. He dealt with the unique properties possessed by plastics and pointed out that the raw materials for their manufacture are available in Britain, adding that every Town Clerk, in seeking new industries for his locality, put plastics on his list and was hopeful.

Propaganda for the efficient use of fuel continues to flow from the Ministry of Fuel and Power. Accompanying the March and April issues of "Fuel Efficiency News" come three new posters for display in works, the latest one incorporating a message from the Minister appealing to workers to be satisfied with a temperature of 60° F. in factories, in accordance with the Factories Act.

The Controller of Factory and Storage Premises of the Board of Trade is compiling a register of firms who will be in need of factory space after the war, and has decided that the approach should be made by the firm to the Board of Trade direct. Firms who are interested in any Government factories which might become available after the armistice should communicate with the Controller of Factory and Storage Premises, Neville House, Page Street, London, S.W.1, indicating their requirements for new factories (location, type, size, etc.).

Elementary training in chemical analysis is offered by the Ministry of Supply to girls of 16-17 holding School Certificate with a credit in science or mathematics. After 3 months' free training (during which the girls receive a living allowance of 40-45s. a week), they are sent to the Chemical Inspection Department's laboratories in various parts of Britain. The Ministry also needs girls interested in physics to train as laboratory assistants for other establishments. Full information can be had from the nearest branch of the Ministry of Labour.

Additions numbering 134 are made to the list of traders in neutral countries with whom dealings of any kind are unlawful, according to the Trading with the Enemy (Specified Persons) (Amendment) (No. 5) Order, 1944 (S.R. & O. 1944, No. 429). Among these are: Graveri S.A., Cia. General de Productos Químicos y Farmaceúticos, Catamarca 37-65, Buenos Aires; Lavroquímica Ltda., Av. Itaquera 177, S. Paulo, Brazil; and Derivados de Hidrogenación S.A. Trabajo s/n, Barcelona. Among the 106 deletions from the list are: Fundiciones, Aleaciones y Metales S.A., "S.A.F.A.M.", Buenos Aires; and Bucellato & Miguel, Soc. Metalúrgica Portuguesa, Lourenço Marqués.

A quenching furnace suitable for small specimens is described by Professor E. A. Owen, University College of North Wales, Bangor, in *J. Scient. Instruments*, April, 1944, p. 65. It makes possible the rapid quenching of materials in lump or in powder form from temperatures up to about 1000° C.

Foreign News

Steel production is again under way in parts of Southern Italy occupied by the Allies.

1500 lb. of fluorspar goes into the preparation of the aluminium contained in a single Flying Fortress, estimates the Aluminium Co. of America.

New large oil-bearing strata have been discovered in the Baku oilfields, reports Moscow radio. Rich deposits of high-grade light naphtha were struck at a depth of 11,000 ft.

Domestic baths of concrete are the subject of specifications being drawn up by the U.S. National Bureau of Standards. The latest samples have a marble-like surface that can be easily cleaned.

Experiments to produce rubber from soya beans are reported to be well under way in Turkey, and to promote these experiments the Turkish Ministry of Economics has allocated the sum of £T250,000.

Oil deposits have been found in the Kiangyu district of Szechwan. According to Professors Chuo Hu-ho and Chi Wen-hua, of Szechwan University, the oil is some 400 feet deep and comparable in quality to Californian oil.

French saboteurs are reported to have put out of action six aluminium plants in the departments of Savoie, Haute-Savoie, Hautes Alpes and Isère. Two-thirds of the country's annual output of aluminium is produced in those departments, and half of that capacity is claimed to have been wrecked.

Reconnaissance shows that, among the war factories damaged or destroyed in recent R.A.F. raids on the Frankfurt district, three I.G. plants have suffered. The explosive and filling factory at Höchst, six miles west of Frankfurt, has had six workshops and four or five storage buildings destroyed or damaged; a second factory at Offenbach, five miles east, has been badly damaged; a third at Mainkur has also been hit.

Estimated production of mercury in the U.S.A. in 1943 was 53,500 76-lb. flasks, of which nearly 70 per cent. came from California. In 1942 the aggregate was 50,850 flasks. The New Idria mine in California, the outstanding producer in the whole country, recorded an output increased by some 75 per cent., and the Hermes mine (also California) likewise made a notable gain. In other areas, however, output decreased, except in Alaska and Idaho.

Brazil has saved petrol to the value of $6 million a year through the use of anhydrous alcohol as motor fuel. Since 1931 the mixing of petrol with alcohol has been obligatory. Capital invested in fuel alcohol production is 20-30 million cruzeiros (1-1½ million dollars).

The Italian chemical company, Rumianca S.A., of Turin, is said to have succeeded in producing insecticides containing little or no copper. One of its products, "Cupramina Beta," contains only 2 per cent. copper, while another, called "Orione," contains none at all.

Sales of native sulphur in the U.S.A. attained a new record in 1943, according to figures of the Bureau of Mines. The total was 3,191,000 long tons, as against 3,032,000 in 1942, and 3,076,000 (the previous record) in 1941. Production, however, at 2,539,000 tons, was 27 per cent. lower than in 1942.

Solvent extraction of tung oil by a continuous process with *n*-hexane is described in *Ind. Eng. Chem.*,. Feb., 1944, p. 138. Extraction efficiencies of 90 per cent. are claimed. The oil is suitable for use in the paint industry, though it is of somewhat lower quality than expressed tung oil.

Analysis of captured German tyres by means of infra-red spectroscopy is recorded in *Ind. Eng. Chem.* (Anal. Ed., Jan. 1944, p. 14). Ten carcase stocks analysed gave natural rubber contents ranging from 20 to 100 per cent., so that it is obvious that the Germans have not yet solved the problem of making all-synthetic tyres.

"Elastic armoured concrete," a composite product of cement and steel wire, is being produced by a large factory at Zagreb, Yugoslavia. The concrete is produced in joists 100 metres long that are electrically cut to order. Daily capacity of the plant is said to be 100 metres. Two similar plants are situated at Hamburg and Paris.

A new soil fumigant, known as "DD," is a mixture of 1, 3-dichloropropylene and 1, 2-dichloropropane. Produced by Shell, it is obtained as a by-product in the manufacture of allyl alcohol from petroleum. For the control of threadworms it is claimed to surpass other fumigants on the grounds of cheapness, low toxicity in use and storage, and ease of application.

Mineral paint-extenders or fillers, now playing a vital part in the preparation of compounds for camouflaging planes, tanks and guns, are the subject of a new U.S. Bureau of Mines publication. This report, Information Circular No. 7264, entitled "Natural Mineral Paint-Extenders," describes the uses of talc, mica, sericite, vermiculite, clay, barytes, witherite, quartz, diatomite, tripoli, gypsum, whiting, siliceous dolomite, slate flour, celestite, magnesite, and asbestos.

Treatment of beach sands of Del Monte, California, to produce a raw material suitable as a source for possible production of flint glass of good colour, has been accomplished in a pilot plant of the U.S. Bureau of Mines, in co-operation with a glass company. The process depends on a specially-designed flotation cell which is so simple that it can be assembled mainly by a carpenter. A copy of the report of the investigation—No. 3740, Beneficiation of Del Monte Sand—may be obtained from the Bureau.

The leading French chemical company Péchiney (Produits Chimiques et Métallurgiques Alais, Froges et Camargue) of Lyons is to absorb a number of smaller companies: the Société Electro-métallurgique de Montricher, the Société des Mines de Charbon des Alpes, and the Société de Lignites de Barjai et du Gard, and the share capital is to be increased from 803,6 million francs to 837 million francs, with a further prospective increase to 1255,5 million francs. The absorption of coal and lignite mining companies deserves attention, as Péchiney has for some time taken an active interest in the production of oil from coal.

Forthcoming Events

The annual meeting of the **British Association of Chemists,** Notts and Derby Section, will be held on **April 29,** at 7.15 p.m., at the Midland Hotel, Derby.

The Royal Institute of Chemistry, Birmingham Section, meets at 11 a.m. on **April 29** to hear a lecture by Mr. R. B. Pilcher, O.B.E., on "Chemists, 1892-1944." Members of the S.C.I., Chemical Society and B.A.C. are invited.

A conference on "Management and Society" is being held by the **Institute of Industrial Administration** from **April 28** to **April 30** at the Waldorf Hotel, London. An address on "Management and the Community" on **April 29** will be given at the conference luncheon by Sir Lynden Macassey, with Sir Francis Joseph (president of the Institute) in the chair.

The annual general meeting of the London Section of the **Society of Chemical Industry** will be held on **May 1,** at 2.30 p.m., in the rooms of the Chemical Society, Burlington House, Piccadilly. The business meeting will be followed by a paper on "The Practical Problems of Thermostatic Control," by Mr. R. Barrington Brock and Mr. L. T. Townson.

The next meeting of the **Electrodepositors' Technical Society,** Midlands Centre, will take place at the James Watt Memorial Institute on **May 2,** at 6 p.m., when Mr. R. W. Harrison, A.C.W.A., will present a paper on "Costing of Electroplating Processes." It is suggested that members might invite works or cost accountants in their own organisation to the meeting.

At a meeting of the **Society of Public Analysts** to be held at 5 p.m. on **May 3** at the Chemical Society's rooms, Burlington House, Piccadilly, the following papers will be presented and discussed: "The Detection and Determination of Auxins in Organic Manures—Extraction of Auxins from Manures and Applications of the Perchloric Acid Test and of the Went Pea Test," by Dr. J. Hubert Hamence; "The Rapid Photometric Determination of Tellurium in Tellurium-Copper Alloys," by Mr. P. B. Crossley, F.R.I.C.; "Detection by Spot Reactions—Detection of Traces of Lead in Water and Fine Chemicals," by Dr. F. Feigl, Dr. Ing., and Mr. N. Braile; "The Softening Point of Fat," by Dr. C. R. Barnicoat, M.Sc., Ph.D. F.R.I.C.

The 27th annual meeting of the Liverpool Section of the **British Association of Chemists** takes place on **May 5,** at 6.30 p.m., at the Stork Hotel, Queens Square.

Company News

British Tar Products, Ltd., announce an interim dividend of 3 per cent. (4 per cent.).

The British Drug Houses, Ltd., announce for 1943 a dividend of 3 per cent. (2 per cent.).

Murex, Ltd., announce an interim dividend of 7½ per cent. (same) in respect of the year to June 30, 1944.

Lacrinoid Products, Ltd., report a net profit for 1943 of £5559 (£5523); a repeated 9 per cent. dividend has already been recorded.

Trading profit of the **Central Provinces Manganese Ore Co., Ltd.,** for 1943 was £713,209 (£668,235). Total dividend on the 10s. ordinary shares is again 22½ per cent., tax free.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an °—followed by the date of the Summary, but such total may have been reduced.)

STEELE AND COWLISHAW, LTD., Stoke-on-Trent, engineers. (M., 29/4/44.) April 1, mortgage, to National Provincial

Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Waverley Works, Shelton, Stoke-on-Trent, with plant, etc.

Satisfactions

CHINNOR CEMENT AND LIME CO., LTD., New Barnet. (M.S., 29/4/44.) Satisfaction April 6, of debenture stock registered October 30, 1936, to the extent of £1336.

DORMAN LONG AND CO., LTD., Middlesbrough, iron and steel manufacturers, engineers, etc. (M.S., 29/4/44.) Satisfaction April 6, of debenture stock registered August 14, 1923, and January 10, 1935.

Company Winding-up Voluntarily

INDEPENDENT PETROLEUM FEDERATION, Ltd. (C.W.U.V., 29/4/44.) March 28 (members), with a view to reorganisation. H. R. Stacey, Ibex House, Minories, E.C., liquidator.

Chemical and Allied Stocks and Shares

STOCK markets have remained inactive, although the general undertone continued firm under the lead of British Funds. Despite the small amount of business, industrials tended to move higher. Owing to the firmness with which they are held, industrial shares are often not in large supply in the market, with the result that prices are inclined to respond readily to any small improvement in demand. Imperial Chemical have been steady at 38s. 4½d., at which figure there is a not unattractive yield on the basis of the 8 per cent. dividend. In fact, the yield of over 4 per cent. compares favourably with the return on numerous other leading industrial shares, including Turner & Newall, Boots Drug, and Courtaulds. Lever & Unilever have remained at 35s. 6d., and Dunlop Rubber strengthened to 41s. 3d., the last-named on hopes that the dividend may be maintained at 8 per cent. United Molasses 6s. 8d. units have shown small movements around 34s., and the units of the Distillers Co. at 90s. were well maintained on balance.

Elsewhere, Babcock & Wilcox kept firm at 50s., awaiting the dividend announcement. Turner & Newall at 83s. 10½d. held virtually all their recent rise and give only a small yield on the bssis of the 12½ per cent. dividend which has ruled in recent years. In the immediate pre-war years, however, dividends up to 20 per cent. were forthcoming, and the general assumption is that after the war a gradual return to this rate seems not unlikely. Many other shares now valued on a small yield basis are considered in the market to offer scope for better dividends after the war, including Triplex Glass 10s. ordinary, now 36s. 7½d., Boots Drug, now 42s. 6d., Barry and Staines at 46s. 6d., and Finchin Johnson 10s. ordinary at 35s.

Yield considerations have tended to attract attention to iron and steel issues. Stewarts & Lloyds were 55s. 3d., United Steel 25s., Staveley 50s., Tube Investment 96s., and Allied Ironfounders 50s. 6d. Richard Thomas 6s. 9d. units were 10s. 9d., Consett Iron 7s. 6d., and Baldwins 4s. ordinary 6s. 1½d. Elsewhere, International Paint further improved to 122s. 6d., and Goodlass Wall 10s. ordinary were 17s. 6d. Steadiness at 79s. 6d. was shown in British Oxygen, and British Aluminium were 47s. 4½d., with Metal Box ordinary 89s. 4½d., and Murex 104s. 4½d. xd. B. Laporte remained firmly held and quoted at 76s. 3d. "middle," while W. J. Bush were again 60s. Awaiting the dividend, British Match were 40s. 9d. and, in other directions, Borax Consolidated became firmer at 35s. 7½d. Satisfaction with the full report and accounts was reflected by firmness in General Refractories at 15s. 7½d. Among textiles, Courtaulds were better at 52s. 3d., and British Celanese at 26s. 6d. Bradford Dyers showed steadiness at 20s. 9d., while Bleachers ordinary and preference have been firm at 10s. 3d. and 18s. 7½d. respectively.

Pending the results, Associated Cement strengthened to 63s. Elsewhere, British Plaster Board at 30s. 9d. lost part of an earlier gain, but were higher on balance. Cellon 5s. ordinary remained firm at 23s. British Drug Houses were 22s., and Burt Boulton 23s. Greeff-Chemicals 5s. ordinary have again been quoted at 7s. 3d., while William Blythe 3s. ordinary were 9s. Nairn & Greenwich were 74s. 4½d. In plastics, De La Rue were 171s. 3d., Erinoid 5s. ordinary 11s., and British Industrial Plastics 2s. ordinary better at 6s. 9d. In other directions, Lewis Berger showed firmness at 105s. Imperial Smelting held their recent improvement to 14s. Gas Light & Coke ordinary were 19s. 7½d. In other directions, Sangers were 25s. 9d., Timothy Whites 33s. 1½d., and Beechams deferred 17s. 3d. Leading oil shares have been inclined to move better on reports of good progress in initial discussion between British and U.S. experts on post-war oil problems. Elsewhere, British Glues and Chemicals 4s. ordinary further improved to 8s. 3d.

British Chemical Prices

Market Reports

REPORTS from most sections of the London general chemicals market indicate active trading conditions, there being a fair weight of prompt and early delivery

business in a wide range of products. Deliveries to consumers under existing contracts have covered good volumes, and the position is regarded as satisfactory. Reports indicate that a fair amount of new business is being transacted, and throughout the market prices remain firm. Among the soda products bichromate of soda is in good demand and a steady inquiry is reported for supplies of bicarbonate of soda, Glauber salt and salt cake. There has been no change in the position of chlorate of soda and the undertone in this section remains extremely firm. In both nitrate and acetate of soda a moderate business is being arranged and values are well held. In the potash section there is a keen inquiry for the limited supplies of yellow prussiate and permanganate of potash, while acid phosphate of potash is a good market. Pressure for contract deliveries is the chief feature of the coal-tar products market, and the firm price position is maintained. The demand for the xylols, benzols, and toluols is steady, while a brisk movement in supplies of creosote oil and cresylic acid is reported.

MANCHESTER.—Textile and most other industrial chemicals have been taken up in steady quantities on the Manchester chemical market during the past week, while new orders have been on a moderate scale. Borax and boric acid, which are now quoted at sharply advanced rates, are meeting with a good demand, while a steady call for supplies is reported in the general run of soda compounds, alum, formaldehyde, and sulphuric and hydrochloric acids, all of which are quoted on an unchanged price basis. Pretty well all classes of tar products, in both the light and heavy groups, are moving into consumption in good quantities at the controlled levels.

GLASGOW.—In the Scottish heavy chemical trade there is no actual change to report during the past week, home business maintaining its steady day-to-day transactions. Export trade still remains rather limited. Prices keep very firm at previous levels. Prompt delivery is getting more difficult.

Price Changes

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £34; crystals, £35; powdered, £35 10s.; extra fine powder, £36 10s. B.P., crystals, £43; powdered, £43 10s.; extra fine, £44 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £84 10s.; powdered, £85 10s.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £62; crystals, £63; powdered, £64; extra fine powder, £66. B.P., crystals, £71; powder, £72; extra fine, £74.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

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